



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

Memorandum

Subject: Final Usage Analysis for methamidophos RED

From: Donald W. Atwood, Entomologist, (703) 308-8088
Herbicide and Insecticide Branch
Biological and Economic Analysis Division

Kathy Davis, Branch Chief (703) 308-7002
Herbicide and Insecticide Branch
Biological and Economic Analysis Division

To: Kimberly Lowe
Special Review Branch
Special Review and Reregistration Division

METHAMIDOPHOS USAGE

Methamidophos is currently registered for use on 3 crops which are produced in the US; tomato, potato, and cotton. In addition, tolerances limits also exist for 3 crops which are imported to the US; peppers (hot and sweet), squash and strawberries. Methamidophos use per crop as a percentage of total methamidophos use is; tomato (31.9%), potato (60.5%), and cotton (7.6%). Irish potato production is by far the major use of methamidophos in the US.

Methamidophos is available in two end user formulations; Monitor 4 Liquid Insecticide (40% AI) and Monitor 4 Spray (40%AI). Methamidophos applications include both seed crop and foliar timings. Application equipment may be aircraft, ground sprayer, or sprinkler irrigation. Application methods include chemigation, high volume spray (dilute) and low volume spray (concentrate). Comparison of application rates in Table 1 with those noted in the following crop discussions indicate that substantially lower application rates are actually used in the field than those on the product label. The following crop discussions provide both suggested application rates and maximum labeled rates.

Table 1. Usage analysis of Methamidophos

Site	Acres Grown (000)	Acres Treated (000)		% of Crop Treated		LB AI Applied (000)			Average Application Rate			States of Most Usage
		Wtd Avg	Est Max	Wtd Avg	Est Max	Wtd Avg	Est Max	% Total Terbufos Use	lb ai/ acre/yr	#appl / yr	lb ai/ A/appl	(% of total lb ai used on this site)
Potato	1421	301	389	21%	27%	390	560	66%	1.3	1.0	1.3	WA ND OR CA ME DE 63%
Tomato	500	94	135	19%	27%	170	295	29%	1.8	1.0	1.7	FL CA 88%
Cotton	12429	36	80	0%	1%	31	70	5%	0.9	1.0	0.9	CA AZ MS LA 83%

COLUMN HEADINGS

Wtd Avg = Weighted average--the most recent years and more reliable data are weighted more heavily.

Est Max = Estimated maximum, which is estimated from available data.

Average application rates are calculated from the weighted averages.

% Total Terbufos Use = crop use (wtd avg)/sum of all crop (wtd avg)

NOTES ON TABLE DATA

Usage data primarily covers 1987 - 1996. Calculations of the above numbers may not appear to agree because they are displayed as rounded;

1) to the nearest 1000 for acres treated or lb. a.i. (Therefore 0 = < 500) or

2) to the nearest whole percentage point for % of crop treated. (Therefore 0% = < 0.5%)

A dash (-) indicates that information on this site is NOT available in EPA sources or is insufficient.

SOURCES: EPA data, USDA, and National Center for Food and Agricultural Policy

Potato (Irish)

Methamidophos Usage:

Methamidophos application in potato represents 66% of total annual methamidophos use in the US. Methamidophos is applied on average to 21% of potato acreage, although variations do occur between production regions. Even though there is significantly less acres dedicated to potato production in comparison to cotton, highest overall poundage of methamidophos is applied to potatoes (390,000 lbs).

Methamidophos is applied to potatoes at a rate of 0.75 to 1.0 lb AI/A. Application methods include; ground, aerial, and chemigation. However, survey of Washington state indicates that nearly all the methamidophos is applied by air using the round robin (or racetrack) method. A small amount of methamidophos is applied by chemigation with ground application being negligible. Methamidophos application in potato is generally a 7 to 10 day preventative program and cannot be applied within 14 days of harvest. The key pests which drive methamidophos use are; aphids, leafhopper, and Colorado potato beetle.

Methamidophos Alternatives:

Alternative insecticides to methamidophos in potatoes are limited due to insect resistance and cost. Methamidophos is the most effective insecticide for pre-emergence and post-emergence control of Green peach aphid (a vector of potato leafroll virus). Imidacloprid is an alternative but is more expensive and does not have the stability of methamidophos in some potato growing regions. There is also concern for pest resistance to imidacloprid in the North Central growing region as it is one of the main insecticides used in the area for pre-emergence pests.

Green peach aphid - Organophosphate (OP) alternatives for aphid control in potatoes include; pre-emergence (phorate, disulfoton, ethoprop and dimethoate) and post-emergence (azinphos-methyl, disulfoton, dimethoate, diazinon, and phosmet). Non-OP alternatives include; pre-emergence (oxamyl, carbofuran, aldicarb, imidicloprid, and rotenone) and post-emergence (endosulfan, esfenvalerate, permethrin, carbofuran, imidicloprid, oxamyl, and methomyl).

Colorado potato beetle - OP alternatives for post-emergence control include; azinphos-methyl, disulfoton, and phosmet. Non-OP alternatives include; carbaryl, carbofuran, oxamyl, esfenvalerate, permethrin, endosulfan, methoxychlor, rotenone, *Bacillus thuringiensis*, rotenone, azadirachtin, cryolite, sodium aluminum fluoride, imidacloprid and cryolite.

Leafhopper - OP alternatives include; azinphos-methyl, diazinon, dimethoate, malathion, and phosmet. Non-OP alternatives for leafhopper control include; carbaryl, carbofuran, methomyl, oxamyl, esfenvalerate, permethrin, endosulfan, methoxychlor, abamectin, and imidacloprid.

Tomato

Methamidophos Usage:

Methamidophos application on tomato represents 29% of total annual methamidophos use in the US. Methamidophos is applied to 19% of tomato acreage. Use of this material on tomatoes is through Special Local Needs (SLN) labeling.

Methamidophos is applied as a foliar spray at a rate of 0.75- 1.0 lb AI/A (with a reduced rate of 0.5-0.75 lb AI/A in Puerto Rico). Number of applications per crop season varies from 3-5

(6-10 pints/acre/crop season) dependent upon specific SLN requirements. Methimidaphos can be applied to tomatoes up to 7 days pre-harvest. Four pest drive methamidophos usage in tomatoes; Aphid, Whitefly, Leafminer, Tomato pinworm and Stink bug.

Methomidaphos Alternatives:

Alternative insecticides are available for most key tomato pests currently controlled with methamidophos. However, in the case of Stink bugs, alternative insecticides are estimated at only 50% the efficacy as provided by methamidophos at a similar cost. It should be considered that carbamates and pyrethroids tend to decimate beneficials and lead to outbreaks of secondary pests.

Aphid - Alternative insecticides available to control aphids include; OP (azinphos-methyl, chlorpyrifos, diazinon, dimethoate, disulfoton, and malathion), carbamate (carbaryl, methomyl, and oxamyl), pyrethroid (cyfluthrin, esfenvalerate, and permethrin), chlorinated hydrocarbon (endosulfan) biological (rotenone), IGR (azadirachtin) and other (imidacloprid and insecticidal soap). Dimethoate is the most effective insecticide for aphid control in California but is hard on beneficials and non-target species. Aphid control in Florida is primarily with methamidophos and imidacloprid. Methamidophos and methomyl are the insecticides most commonly used for Aphid control in the North Central US (OH, IN, and NY). New insecticides which are effective for aphid control in tomato include pymetrozine.

Whitefly - Alternative insecticides for whitefly control include; OP (azinphos-methyl and chlorpyrifos), carbamate (oxamyl and methomyl), pyrethroid (cyhalothrin-lambda, cyfluthrin, esfenvalerate, fenpropathrin, permethrin, and pyrethrin), chlorinated hydrocarbon (endosulfan), IGR (azadirachtin) and other (imidacloprid and insecticidal soap). New chemicals which are effective against whitefly include buprofezin, bifenthrin, and pyriproxifen). Imidicloprid has high usage nationally for whitefly control.

Leafminer - Alternative pesticides to control leafminer include; OP (azinphos-methyl, diazinon, dimethoate, and disulfoton), carbamate (oxamyl), pyrethroid (pyrethrin), chlorinated hydrocarbon (endosulfan), IGR (azadirachtin and cyromazine), biological (abamectin), and other (insecticidal soap and petroleum oil). Methamidophos has the highest usage for leafminer control in California.

Tomato pinworm - Alternative pesticides to control Tomato pinworm are; OP (azinphos-methyl and chlorpyrifos), carbamate (carbaryl and methomyl), pyrethroid (cyfluthrin, esfenvalerate, fenpropathrin, and permethrin), biological (*Bacillus thuringiensis*, tredecen acetate pheromone, and abamectin), IGR (azadirachtin), and other (cryolite). Methomyl and *Bacillus thuringiensis* have high efficacy and highest usage for pinworm control in Florida.

Stink bug - Although Stink bugs are only an occasional pest, methamidophos is the only effective insecticide available. Alternatives insecticides include; OP (azinphos-methyl), carbamate (carbaryl), pyrethroid (cyfluthrin, lambda-cyhalothrin, pyrethrin), chlorinated hydrocarbon (endosulfan).

Cotton

Methamidophos Usage:

Methamidophos application in cotton represents only 5% of total methamidophos use in the US. Methamidophos is applied to less than 1% of total US cotton acreage. Average number of methamidophos applications is one per year at a rate of 0.9 lb/AI. Labeled rate varies from 0.5

to 1 lb/AI/A depending upon pest species, time of application, and infestation level. Application is foliar with restrictions limiting application to the period prior to boll opening. Methamidophos use in cotton is under Special Local Need (SLN) labeling in the states of AR, CA, MS, LA, and TN. plant with each plant producing a single crop per year. Although labeled for use against numerous pests, whitefly is the only pest targeted with methamidophos in cotton.

Methamidaphos Alternatives:

Numerous insecticides are available for whitefly control in cotton. These include; OP (acephate, chlorpyrifos, dicotophos, malathion, methidathion, phorate, and profenofos), carbamate (aldicarb and methomyl), pyrethroid (bifenthrin, esfenvalerate, fenpropathrin, permethrin, pyrethrin, and zeta-cypermethrin), chlorinated hydrocarbon (endosulfan), IGR (buprofezin and pyriproxyfen), other (imidacloprid, insecticidal soap, and petroleum oil). Additional new chemicals with efficacy against whitefly include pymetrozine. Whiteflies are generally only a pest in the western cotton region.

Sources:

1. EPA Proprietary data.
2. EPA QUA. 1999.
3. EPA QUA+. National Center for Food and Agricultural Policy
3. EPA Crop Matrices - Potato, Tomato, and Cotton. 1998-99. US EPA BEAD/HIB.
4. Agricultural Statistics 1998. National Agricultural Statistics Service. USDA.
5. Insect and Disease Control Guide. 1999. Meister Publishing Company.
6. USDA Crop Profiles.